

## Editorial

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# Editorial: Solutions to water crises (related to actual interventions)

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## Editorial on the Research Topic

### Solutions to water crises (related to actual interventions)

Water science has become “pluralistic” (Evers et al., 2017) to collectively (yet differently) understand complex water systems with promising combinations of compatible and complementary disciplines. The contemporary context of water science discusses the more severe water-society challenges of the Anthropocene. Yet, the conversation is not definitive; indeed, there are unending debates between quantitative and qualitative research approaches including methodological choices and accuracies along questions of scales, themes, and politics of funding. Transdisciplinary applications and cross-sectoral engagements offer solution-oriented water just trajectories – scientists, practitioners, and user groups designing and deploying “solutions” related to actual interventions in addressing water crisis.

However, “solutions” has its own baggage. Mainstream solution designs and implementation strategies are not free from the dangers and dogmas of “path-dependence” (Mahoney and Schensul, 2006). That is, they are often heavily loaded with lineages from the past, and with limited capacities to solve problems that are “wicked” – multi-dimensional, dynamic, and recurring. The post-development era on “sustainability” (Castro, 2004) takes us through the critical “solution” route at global scales, when development agencies desperately transported and transplanted “first world” solutions on the “third world” “poor,” “uncertain,” and “ignorant” communities, resulting into development of underdevelopment (Frank, 1969), distinctly demonstrating the problematic aspects of universally designed prescriptive solution packages, manufactured in alienated contexts (Therkildsen, 1988). The articles in this Research Topic explore the chasm between bourgeoisie environmentalist notions and traditional river rituals (Bhattacharya et al.), how ignoring indigenous water treatment beliefs can reduce sanitation access (Daniel et al.), shadow water supply projects filling the gap left by tourism-fuelled economies (Sarkar), and other unintended consequences of top-down, large-scale water infrastructure as technological fixes.

But are “local,” “small-scale,” “community-based” adaptive practices effective and efficient enough to solve environmental/water crises, with far flung outcomes and impacts within and beyond situated geographies? The answer is not simple; it is unwise to fall prey to binary reductionisms, pitting “small” against “big,” “cost-effective” against “costly,” “ecofriendly” against “environmentally malign,” and “indigenous” against “modern”. The authors have problematized “solutions” with rich, diverse, dense, and in-depth empirical investigations using transdisciplinary water-society perspectives.

Basel et al. unveils the paradoxes within the otherwise hydrologically and socially promising small-scale managed aquifer recharge (MAR), exemplifying “how such interventions play out within the complexity of the socio-hydrological system in which they are implemented” (p. 1). Here, the application of political ecology enables the authors to study the interplay between biophysical, climate, and social systems and account for both positive (drought reduction chances) and negative feedback loops (time lag between implementation and benefits reducing community willingness to act). Thus, they scientifically refrain from overestimating or oversimplifying small-scale MAR as a solution, while advocating for its practical implementation. The article underscores place-based dynamics in determining complex human-water interactions within and beyond local landscapes, emphasizing the need to critically understand climate trends using a power-sensitive approach, sensitizing us with non-linearities and complexities socially embedded in small-scale MAR.

Solutions at micro-settings with household as the unit of analysis, have been discussed by Daniel et al., manifesting how socio-economic characteristics (SECs) and psychological factors determine behavioral choices in adopting to household water treatment (HWT) as a feasible technology in improving the quality of potable water in developing economies. The authors implement the RANAS (Risk, Attitude, Norm, Ability, and Self-regulation) approach to map psychological trajectories of 377 households inhabiting East Sumba, Indonesia – one of the poorest localities with inadequate public utilities. Identifying correlation between SECs and RANAS, the study reveals how worldviews and belief systems, ability to access local infrastructures, and habituated and affective familiarity (taste of water) within situated contexts facilitate or impede solution-oriented strategies, impacting (un)just water futures. Moncaleano et al. extend the use and analysis of behavioral and human psychological variables in investigating water use efficiency (WUE). Following a systematic review of literature, the authors deliver a conceptual model integrating contextual (socioeconomic, technical, institutional, and environmental) and behavioral factors (RANAS, Values, Beliefs and Norms and trust) to represent potential WUE cause-effect relationships. Together these articles extend the application of the RANAS framework to new realms of the water supply space, while generating knowledge regarding the pathways connecting behavioral and technological concepts.

Mukherjee et al. off-loads social hierarchies in the developing and hyper-urbanizing metropolis of Asia, actuating differentiated access to utilities and unjust water trajectories. Critically analyzing primary household data from Kolkata (India), the article advocates for specifically designed inclusive water solution strategies to accommodate the most marginalized, namely gender, trans-individuals, and children, inhabiting more vulnerable and unequal (peri)urban spaces such as slums or *bastis*. In similar vein, Sarkar validates how water crises in a hill city (Shimla) of India should be understood beyond hydrological (erratic rainfall due to climate change) and other physical and socio-economic factors (urban growth and tourism), and as an outcome of infrastructural politics shaping unequal and unjust water conjectures. Sarkar also uses an urban (situated) political ecology approach to read uneven waterscapes of Shimla. The case study argues that “the water

crisis, as a context, is dialectical” (p. 1). And thus, in spite of implementation of several hydraulic projects, “...the inherent fissures of inequality within the city that cause differential access to water remain” (p. 1).

Inclusive water governance frameworks are keys in making low-cost, local technologies work viz. water reuse. Frick-Trzebitzky et al. map the success of an informal municipal partnership engaging a group of interdisciplinary researchers, municipal decision-makers, engineers, and farmers in water reuse in agriculture in Namibia. They investigate complex interplays between human behavioral aspects, functioning of the institutional landscape, and physical-material configurations, and discuss the value of cross-sectoral collaboration in fostering municipal capacities toward efficient water reuse as a sustainable solution in Africa. Koehler et al. examines the knowledge to action framework, investigating interconnections between water politics and policy making, focusing on Kitui County, Kenya. The authors place a provocative proposition for readers to reflect and contemplate: “What if, instead of policy producing practice, practices produce policy?” (p. 11). Documenting detailed insights and recommendations from a knowledge co-production workshop, involving participation of (women) fishers, researchers, fishworkers” forum (partner NGO), and scientists, Ghosh et al. deploy solution-focused participatory research to capture intersecting social-ecological and socio-hydrological variables in the least explored dried fish sector of the Sundarbans delta.

Bhattacharya et al. reinforce this “transdisciplinary exigency” (Mukherjee et al., 2022), weaving together cherishable moments of collaborative governance, accommodating agencies of (more-than-human) actors on the heritage river the Adi Ganga, flowing through the Kolkata metropolis. The authors apply historical urban political ecology (HUPE) (Mukherjee, 2020) to perceive urban riverscapes as adaptive “living systems infrastructure” (Mukherjee, 2022), dotted with (a)synchronous space-time movements and flows. Thus, “solution” is imagined through nuanced interpretations of numerous “(un)successful attempts to revive the river beyond global conceptualizations of what a “river” should be.”

The diverse range of spatio-empirics across different themes on water-society interactions constituting this issue complexifies “solutions,” conveying its temporal, relational, and political edges, and thus offer opportunities to appreciate fluidities, beyond fixed prescriptions, standardized and strategized upon by powerful techno-environmental groups and political lobbies.

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## Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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